United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, NO TILL

CODE 329

(ac)

DEFINITION

Minimize soil disturbance and manage the amount, orientation and distribution of both crop and plant residue to provide cover on the soil surface throughout the year.

PURPOSE

This practice supports one or more of the following purposes:

- Reduce sheet, rill and wind erosion and excessive sediment in surface waters.
- Reduce tillage-induced particulate emissions.
- Improve soil health by maintaining or increasing soil organic matter quantity.
- Improve soil health by improving soil aggregate stability
- Improve soil health by improving habitat for soil organisms
- Increase plant-available moisture.
- Reduce energy use.
- Provide habitat for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

Distribute all residues after harvest uniformly over the entire field. Moving residue away from the seeding or transplant area prior to or as part of the planting operation is acceptable.

Residue will not be burned.

There is no full-width soil disturbance performed from the time immediately following the harvest of one cash crop through harvest of the next cash crop (i.e. the crop interval) in the rotation regardless of the depth of the tillage operation.

In-row soil disturbance operations may be allowed when implementing this practice, such as planting, nutrient placement, or a seed row/furrow closing or covering device.

The soil tillage intensity rating (STIR) value must include all field operations that are performed during the crop interval (includes fallow periods). The crop interval STIR value will be no greater than 20. If cover crops or low disturbance manure injectors are used within the crop interval, then the crop interval STIR value will be no greater than 30.

Additional Criteria to Reduce Sheet, Rill and Wind Erosion, Reduce Excessive Sediment in Surface Waters, and Reduce Tillage-Induced Particulate Emissions

Use the current approved water and wind erosion prediction technology to determine if the field operations and crops planned provide necessary level of erosion control. Base the determination on the amount of surface residue expected to be present, the time of year when residue is expected to be present and the planned amount of surface soil disturbance in the field. Include the effects of other practices in the management system (i.e. crop rotation, cover crop, or contour farming) when making the determination.

Additional Criteria to Maintain or Increase Soil Organic Matter Quantity

To maintain soil organic matter quantity, ensure the soil condition index (SCI) for the cropping system is positive.

To increase soil organic matter quantity, ensure the (SCI) for the cropping system is positive and in a positive trend from the benchmark system.

Additional Criteria to Improve Soil Aggregate Stability and Habitat for Soil Organisms

Ensure adequate protection of soil aggregates and habitat for soil organisms by managing the amount, orientation, and distribution of crop residues. Include diverse crop and plant types adapted for the region and that are practical for the rotation.

Soil surface must have a minimum of 70 percent residue or crop canopy cover throughout the year to provide habitat, moderate soil surface temperature, and protect soil aggregates.

Additional Criteria to Increase Plant-Available Moisture

Maintain a minimum of 60 percent residue cover on the soil surface throughout the year.

Trapping snow

Minimum crop stubble height during the time significant snowfall is expected to occur shall be—

- At least 10 inches for crops with a row spacing of less than 15 inches.
- At least 15 inches for crops with a row spacing of 15 inches or greater.

Additional Criteria to Reduce Energy Use

Reduce the total energy consumption associated with field operations by at least 25 percent compared to the benchmark condition. Use the current approved NRCS tool for determining energy use to document energy use reductions.

Additional Criteria to Provide Habitat for Wildlife

Use an approved habitat evaluation procedure to determine when residue needs to be present, and the amount, orientation, and stubble height needed to provide adequate food and cover for target species.

CONSIDERATIONS

Considerations

Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant, and air resources.

Production of adequate crop residues to achieve the purpose(s) of this practice can be enhanced by using high residue crops and crop varieties, use of cover crops, double cropping, and adjustment of plant populations through seeding rates and row spacing.

When this practice is implemented for organic producers, ensure residue and tillage management, activities are consistent with the USDA Agricultural Marketing Service National Organic Program regulations.

Not shredding residue after harvest reduces potential for movement by wind or water. Shredding can also create areas of accumulation, which can interfere with planting the next crop. Standing residue is easier to plant into than flat residue.

Considerations to Improve Soil Health

The effects of this practice can be enhanced by implementing it for all crops in the rotation or cropping system with at least one practice addressing each of the below-listed key soil health management principles and applicable sub categories:

- Minimize disturbance-
  - Physical- Residue and Tillage Management, Reduced Till (Code 345) and Prescribed Grazing (Code 528)
  - Chemical- Nutrient Management (Code 590), Pest Management Conservation System (Code 595), Salinity and Sodic Soil Management (Code 610)
  - Biological- Cover Crop (Code 340), Prescribed Grazing (Code 528), Forage and Biomass Planting (Code 512), Forage Harvest Management (Code 511)
- Maximize soil cover-
  - Residue- Residue and Tillage Management, Reduced Till (Code 345) and Mulching (Code 484)
  - Vegetative- Cover Crop (Code 340), Prescribed Grazing (Code 528), Forage and Biomass Planting (Code 512),
- Maximize biodiversity-
  - Cover Crop (Code 340), Prescribed Grazing (Code 528), Forage and Biomass Planting (Code 512), Conservation Crop Rotation (Code 328),
- Maximize presence of living roots-
  - Cover Crop (Code 340), Prescribed Grazing (Code 528), Forage and Biomass Planting (Code 512), Conservation Cover (Code 327), Conservation Crop Rotation (Code 328).

When applying agrochemicals, consider the potential impact on the soil organisms and consult with a qualified professional to develop alternative application techniques or alternative agrochemicals that have lower adverse impacts on soil organisms.

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance, and the soil moisture content and soil temperature at the time the disturbance occurs. To make this practice more effective at reducing carbon loss—

- Perform any deep soil disturbance, such as subsoiling or nutrient injection, so the vertical slot created by the implements is closed at the surface.
- Plant with a single disk or slot opener no-till drill to release less carbon dioxide (CO_2) and reduce oxidation of organic matter compared to wide-point hoe/chisel opener seeder drill.
- Perform soil disturbance when soil temperatures are below 50° F to oxidize less organic matter and release less CO_2 than operations done when the soil is warmer.
- Maximizing year-round coverage of the soil with living vegetation (e.g., cover crops) and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation.

Considerations to Increase Plant-Available Moisture

Performing all field operations on the contour will slow overland flow and allow more opportunity for infiltration.

Leaving stubble taller than the 10-inch minimum will trap more snow.

Leaving high carbon residues that cover as much of the surface as possible will reduce soil evaporation.

Variable-height stubble patterns may be created to further increase snow storage.

Considerations for Wildlife Habitat

Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife habitat, beneficial insects, and pollinators.

Leaving unharvested crop rows for two growing seasons will further enhance the value of these areas for wildlife.

Leave crop residues undisturbed after harvest (e.g., no shredding or baling) to maximize the cover and food source benefits for wildlife.

PLANS AND SPECIFICATIONS

Develop plans and specifications for each field or treatment unit according to the Criteria section requirements above, and operation and maintenance section requirements below. Specifications must describe the requirements to apply this practice to achieve the intended purpose. Record the following specification components in an approved Residue and Tillage Management, No-Till (Code 329) implementation requirements document.

- Purpose for applying the practice.
- Planned crop(s) and cover crops, if applicable.
- Amount of residue produced by each crop, either measured or estimated by erosion tools.
- Orientation of the residue (i.e. standing, flat).
- List all field operations or activities that affect—
    - Residue distribution and orientation including height (where applicable).
    - Surface disturbance.
    - Amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year (month) it must be present.
- Planned STIR value, SCI value, and erosion rate for the crop interval.
- Target species of wildlife, if applicable.
- Benchmark and planned energy (fuel) consumption, if applicable.

OPERATION AND MAINTENANCE

Evaluate/measure the crop residues cover and orientation after each crop to ensure the planned amounts and orientation are being achieved. Adjust management as needed to either plan a new residue amount and orientation or adjust the planting equipment, and if applicable, the harvesting equipment.

Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 10 percent of the field may be tilled for this purpose.

If there are areas of heavy residue accumulation (because of movement by water or wind) in the field, spread the residue prior to planting so it does not interfere with planter operation.

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